

## CLAIMS

What is claimed is:

1. A method for post-etch cleaning of a damascene structure having a barrier layer disposed over at least a portion of an underlying copper metallization layer and a dielectric layer disposed over at least a portion of the barrier layer, comprising:
  - etching at least one opening through the dielectric layer and the barrier layer to expose at least a portion of the underlying copper metallization layer and form an etched structure; and
  - subjecting the etched structure to an aqueous solution in an environment wherein the etched structure is substantially shielded from ambient light.
2. The method of claim 1, wherein subjecting the etched structure to an aqueous solution comprises subjecting the etched structure to an aqueous solution comprising about 7.0% by weight acetic acid, about 0.4% by weight nitric acid and about 0.15% by weight hydrofluoric acid.
3. The method of claim 2, wherein subjecting the etched structure to an aqueous solution comprising about 7.0% by weight acetic acid, about 0.4% by weight nitric acid and about 0.15% by weight hydrofluoric acid comprises subjecting the etched structure to the aqueous solution for a period of time ranging from about 30 seconds to about 2 minutes.
4. The method of claim 1, wherein subjecting the etched structure to an aqueous solution comprises subjecting the etched structure to an aqueous solution comprising dilute hydrofluoric acid.
5. A method for forming a damascene structure having an underlying copper metallization layer, comprising:
  - forming a barrier layer over at least a portion of the underlying copper metallization layer;
  - forming a dielectric layer over at least a portion of the barrier layer;

etching at least one opening through the dielectric layer and the barrier layer to expose at least a portion of the underlying copper metallization layer and form an etched structure; and

subjecting the etched structure to an aqueous solution in an environment wherein the etched structure is substantially shielded from ambient light.

6. The method of claim 5, wherein subjecting the etched structure to an aqueous solution comprises subjecting the etched structure to an aqueous solution comprising about 7.0% by weight acetic acid, about 0.4% by weight nitric acid and about 0.15% by weight hydrofluoric acid.

7. The method of claim 6, wherein subjecting the etched structure to an aqueous solution comprising about 7.0% by weight acetic acid, about 0.4% by weight nitric acid and about 0.15% by weight hydrofluoric acid comprises subjecting the etched structure to the aqueous solution for a period of time ranging from about 30 seconds to about 2 minutes.

8. The method of claim 5, further comprising forming a diffusion barrier over the etched structure subsequent to subjecting the etched structure to the aqueous solution while maintaining the etched structure in the environment wherein it is substantially shielded from ambient light.

9. The method of claim 8, further comprising:  
forming a bulk copper layer over the diffusion barrier such that the at least one opening is filled therewith; and  
planarizing the bulk copper layer to a surface of the dielectric layer.

10. The method of claim 5, wherein subjecting the etched structure to an aqueous solution comprises subjecting the etched structure to an aqueous solution comprising dilute hydrofluoric acid.

11. A method for substantially preventing corrosion of copper metallization exposed through an opening etched in an overlying material layer of a damascene structure during an aqueous post-etch cleaning, comprising:

subjecting the damascene structure to an aqueous solution while maintaining the damascene structure in an environment wherein it is substantially shielded from ambient light; and

forming a diffusion barrier over the damascene structure and walls of the opening subsequent to subjecting it to the aqueous solution while maintaining the damascene structure in the environment wherein it is substantially shielded from ambient light.

12. The method of claim 11, wherein subjecting the damascene structure to an aqueous solution comprises subjecting the etched damascene structure to an aqueous solution comprising about 7.0% by weight acetic acid, about 0.4% by weight nitric acid and about 0.15% by weight hydrofluoric acid.

13. The method of claim 12, wherein subjecting the damascene structure to an aqueous solution comprising about 7.0% by weight acetic acid, about 0.4% by weight nitric acid and about 0.15% by weight hydrofluoric acid comprises subjecting the damascene structure to the aqueous solution for a period of time ranging from about 30 seconds to about 2 minutes.

14. The method of claim 11, wherein subjecting the damascene structure to an aqueous solution comprises subjecting the etched damascene structure to an aqueous solution comprising dilute hydrofluoric acid.